

striate, the punctures very irregularly placed on the striæ, the latter obsolete towards the apex; interspaces very minutely granulose-punctate, sparingly aciculate.

Genus DEUTEROCAMPTA, *Erichs.*

DEUTEROCAMPTA SAUNDERSI, n. sp. Ovata, convexa, nigra, nitida; thorace subremote punctato, lateribus latis margineque apicali angusto, medio angulato, flavis; elytris evidentè punctato-striatis, utrinque vitta suturali, basi et apice angustata, maculisque sex, superficiem fere amplectentibus, nigris ornatis; harum duabus communibus, prima pone basin, subcordata, secunda ante apicem, transversim trigonata, tertia subrotundata, ad marginem humeralem adfixa, quarta et quinta prope medium transversim positæ, oblongis, externa postice obliqua, ad marginem adfixa, sextaque marginali, minore, ad plagam communem trigonatam parallela. Long. 4 lin.

Hab. Brazil; a single specimen, formerly in the collection of Mr. W. W. Saunders.

Four lower joints of antennæ, together with the palpi, piceous; face excavated and distinctly punctured on either side; middle of front and vertex nearly impunctate, impressed with a fine longitudinal groove; upper margin of clypeus angulate; antennæ slightly less than half the length of the body, the four lower joints piceous, the five outer ones distinctly thickened. Thorax nearly three times as broad as long; sides nearly parallel at the base, rounded and converging in front; disk subremotely punctured, sides impunctate.

The Life-history of *Filaria bancrofti*, as explained by the Discoveries of Wucherer, Lewis, Bancroft, Manson, Sonsino, myself, and others. By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S., Professor of Botany and Helminthology, Royal Veterinary College.

[Read March 7, 1878.]

THE time has now arrived when we may, with profit, pass in review the essential facts of Hæmatozoal discovery in relation to this *Filaria*, and build up, as it were, a complete life-history of one of the most remarkable parasites that has ever engaged the attention of helminthologists. In short, I propose to show the steps by which we have acquired our present knowledge, what that knowledge actually expresses when summarized in the lowest possible number of convenient terms, and what practical consequences may be expected to flow from a fuller recognition of its

importance. The practical issues especially affect the welfare of persons resident in warm countries.

In the year 1868 Dr. O. Wucherer, since deceased, published a paper in the 'Bahia Medical Gazette,' entitled, "Preliminary Notice of a hitherto undescribed Species of Worm encountered in the urine of persons affected with the intertropical hæmaturia of Brazil" (Ref. No. 1*). Dr. Wucherer first discovered this entozoon on the 4th of August, 1866, when engaged in examining the chylous or milky urine of a patient then under his care at the Misericordia Hospital. He was at the time actually in search of the *Bilharzia hæmatobia*. It was at the suggestion of Griesinger that Wucherer sought for this fluke; and when thus engaged he found in its place, so to say, "some filiform worms which were very narrow at one extremity and very obtuse at the other." As will be seen in the sequel, a similar experience afterwards occurred to myself. Dr. Wucherer, with a caution worthy of the true *savant*, did not at once conclude that the urinary parasites had actually passed from his patient; therefore taking the necessary steps to prevent error, he obtained a fresh supply of the excretion in a carefully cleaned vessel, and almost immediately afterwards verified his previous discovery. In the following October, and also subsequently, Wucherer made similar "finds." In two of these three instances the patients suffered from chyluria; and in the third there was hæmaturia. The *Filarie* were in all cases living and active in their movements. He did not notice any eggs †.

In the year 1869 (when engaged in preparing a supplementary bibliography to my introductory treatise on the Entozoa) I chanced to stumble upon a paper by Dr. Salisbury which had hitherto escaped the attention of helminthologists (Ref. No. 2). In this memoir, published in 1868, Dr. Salisbury announces the discovery of a small species of entozoon in the bladder of a patient who passed milky urine. Dr. Salisbury had the boldness at once to describe the worm as new to science, and placed it in the genus *Trichina* (*T. cystica*, Salisb.). Nothing, I may remark, could be more striking than the difference of attitude assumed

* The numbers here given refer to the Bibliography at the close of this communication.

† Some error as to the date of Wucherer's discovery has crept into the literature of this subject. Thus, in the 2nd edition of Davaine's 'Traité' (p. 943) the year 1868 is mentioned as that in which the original find was made. In this matter I have followed the authority of Dr. Silva Lima.—T. S. C.

by Wucherer and Salisbury respectively. The one *savant* was timid and reserved, almost to silence, respecting his find (which had absolute priority), whilst the other put a totally wrong construction on the facts observed. Dr. Salisbury unhesitatingly relegated these mere embryonal forms to a genus with which there was not a shadow of proof that it was entitled to be associated.

During the month of March 1870, Dr. T. R. Lewis, of Calcutta, noticed that minute Nematoid worms were present in chylous urine. He did not, it seems, publish the fact at the time; but in his Memoirs, which appeared some years afterwards, he distinctly records the circumstance. In October 1872 he repeated his investigation of the urine of one of the patients examined in 1870, and had the satisfaction of finding the young *Filaria*, which "had undergone no appreciable change." He also examined the blood, with results that will appear in the sequel. Dr. Lewis states that Dr. Charles and Dr. Palmer were the first to verify his observations respecting the presence of *Filaria* in chyluria.

In the month of July 1870, whilst engaged in the examination of the urine of a little girl (who was under my professional care as a sufferer from the Bilharzia disease, which she had contracted at Natal, South Africa), I discovered numerous eggs and embryos of a nematode worm. Although thousands of fluke's eggs passed daily from this child, with much blood, it never occurred to me that the nematodes were hæmatozoal. The circumstance that the child's parent had told me that three small worms had long before passed by the urethra, led me to conclude that they and their probable progeny were alike of urinary origin. Had I examined a drop of blood from the finger, Dr. Lewis's subsequent important discovery of microscopic Hæmatozoa would probably have been anticipated. I do not at all regret that I was thus misled.

It was not until the spring of 1872 that I announced my interesting find (Ref. No. 3). When doing so I did not seek to secure scientific capital by imparting to mere embryos a generic and specific title, but remained content to record the facts observed, at the same time giving simple figures of the worm as seen in the free and egg conditions. The notion which Leuckart has since suggested, that the three mature worms alluded to were Oxyurides, is by no means convincing (Ref. No. 4). As the mother of the child more than once pointed to her finger's length

as indicating to me the length of the worm, I now incline to the opinion that the worms in question were none other than sexually mature examples of *Filaria bancrofti*. This view, moreover, receives strength from the circumstance that I drew long thread-like strokes on paper which, she said, corresponded in appearance with the worms. As to the thickness of the worms, nothing reliable was said. When I wrote the original paper I had no knowledge of the fact that Wucherer had anticipated Salisbury's previous discovery by about two years.

In and about the year 1872 several 'finds' of a similar order to those above announced were made in foreign countries. I regret that I cannot fix the dates of all these verifications with absolute precision. In September 1872 Dr. Corre published a "Note respecting the helminth encountered in hæmatochylous urine" (Ref. No. 5). His careful description clearly refers to the same entozoon as that already described by Wucherer, by Salisbury, and by myself. Again, in a communication addressed to Dr. Davaine, and quoted in the recently published 2nd edition of his (Davaine's) well-known work, Dr. J. Crevaux refers to a hæmaturia patient of his, at Guadeloupe, from whose urine he had frequently obtained small worms (*vers de la Guadeloupe*). He had, however, more than a hundred times punctured his patient for the purpose of examining fresh blood; but in no single instance did he detect microscopic Hæmatozoa (Ref. No. 6). If I understand rightly, Corre's description refers to worms obtained from this selfsame patient.

In Dr. Crevaux's remarks especial reference is made to a joint memoir previously published by Dr. da Silva Lima and himself (Ref. No. 7). Dr. Crevaux adds that although Dr. Lima diligently sought for hæmatozoa in five separate patients whose urine contained numerous worms, yet in no instance were any entozoa found in the blood. Notwithstanding the recorded differences as between the "*vers de la Guadeloupe*" described by Crevaux and Corre and the "*vers du Brésil*" described by Wucherer and Silva-Lima, I can see no valid reason for supposing that they are not identical forms.

In this place must also be noticed a very interesting circumstance recorded by Robin (Ref. No. 8). He says that Dr. Foncervines transmitted to him the history of a case of chyluria affecting an officer residing at Réunion Island. In this case some blood-clots taken from the urine were found to contain embryonic

Nematodes. Two years subsequently, the dried clots being softened in water, were still found to contain the worms tolerably well preserved. From the date of the publication of Robin's 'Lectures,' Dr. Foncervines's 'find' could not, I presume, have been made later than 1872. Not improbably it occurred at an earlier date. M. Robin gives a figure of one of the worms. The length and thickness of it do not materially differ from the measurements of the Guadeloupe worm as given by Dr. Corre. I hold that the slight discrepancies which do exist in respect of size are of little or no moment. Stages of growth are alone sufficient to account for some of them. The presence of an outer skin, which some have spoken of as a cyst, cannot be held either to settle or even to influence the question of specific identity. The outer envelope, so far from its being in any sense comparable to an adventitious cyst or "sheath," as Lewis calls it, actually represents the original embryo-skin separating by ecdysis. Its nature ought to have been recognized from the very first; but Lewis appears to have thought that the presence of "delicate, translucent sheaths" indicated a material departure from the appearances commonly presented by "the young of many other Nematodes."

Early in the month of July 1872 Dr. Lewis made his interesting discovery of Nematode Hæmatozoa in the blood of an Indian native suffering from diarrhœa; and in the month of October of the same year he detected microscopic *Filaria* in the blood of one of the patients in whose urine he had detected similar worms more than two years previously. This is the case I have previously quoted. Without repeating any details, it suffices to remark that the urinary parasites and the Hæmatozoa were identical. Dr. Lewis, recognizing the importance of his discovery, named the larval parasite *Filaria sanguinis hominis* (Ref. No. 9). Of course it was not possible for Lewis to declare that his embryonal nematoids must belong to the genus *Filaria*, since the embryos of other nematode genera very closely resemble these microscopic hæmatozoa. However, the proposed nomenclature, so far as the genus was concerned, turned out to be a 'lucky hit.'

The subsequently discovered parent worm may fairly be relegated to the genus in which Lewis thus happily placed it. We now know, or at least are fully persuaded, that the larval worms first discovered by Wucherer are identical with those separately

found by Lewis, Salisbury, Crevaux and Corre, da Silva Lima, Foncervines, and myself. If, therefore, the original discoverer's name must stand in connexion with the genus *Filaria*, the worm in question ought, in all fairness, to be permanently recognized as *Filaria wuchereri*. I hold, however, that in the present case the parasite of Wucherer, of Salisbury (who placed it in the genus *Trichina*), and of others (who either, like myself, did not choose to give it a special name, or who, like Salisbury, adopted an erroneous nomenclature) should carry with it the name of the person who was the first to discover and to describe the sexually mature representative of the hæmatozoa. Such a recognition can in no way detract from the supreme merits of Lewis. In the next place it does no injury to Wucherer's priority in the matter of the original discovery of the larva. In the third place no injustice is done to Manson, whose remarkable discovery of the intermediate host places the fame of his research on an equally secure basis. In short, the helminthologist of the future, when dealing with the question of the discovery of this entozoon, will find himself obliged to bracket the names of four distinguished observers together. Would he seek to be disinterestedly just, he must also award more or less conspicuous merit to the several other workers whose names will naturally be read between the lines that record the discoveries of Wucherer, Lewis, Bancroft, and Manson.

In this connexion the 'finds' of Drs. Sonsino, O'Neill, Araujo, and Felicio dos Santos cannot be passed over. It was on the 1st of February, 1874, that Sonsino detected microscopic *Filaria* in the blood of a young Egyptian Jew (Ref. No. 10). He records the fact in the following words:—"I put a drop of blood (from the finger of the boy) under the microscope, placing it directly under the objective glass, when with astonishment I discovered a living organism in the midst of the hæmatic globules. The nematoid had the shape of an *Anguillula*, as fig. 6 (in Dr. Sonsino's memoir) represents. It glided amongst the blood-globules, which were tossed to and fro by its lively movements." Dr. Sonsino verified his observation on the 6th of the same month; nevertheless, neither himself nor his colleagues (Drs. Ambron, Dacorogna, Dutrieux), nor Dr. Abbate Bey, to all of whom the facts were demonstrated, could at first persuade themselves that the worms had really come from the blood. It was not until Sonsino had become acquainted with the facts that I had recorded

in respect of my little hæmaturic patient from Natal that he was fully satisfied as to the genuineness of his 'find' and as to the identity of the parasitic forms in question.

In the year 1875 Dr. O'Neill found similar or, to use Dr. Silva Lima's words, "the same microscopic *Filarix* proceeding from the skin affected with a disease peculiar to negroes, and which they called 'craw-craw.'" About the same time Dr. Araujo also encountered this *Filaria* in a negro at Bahia suffering from the same disease. Dr. Araujo named the worm *Filariose dermatemica* (Ref. No. 11). It is worthy of remark, in passing, that in the 'craw-craw' cases the persons affected were not chyluric. Further in this connexion, and in support of the parasitic theory of hæmatochyluria, Dr. Silva Lima refers to the writings of Dr. Almeida Couto (Ref. No. 12), and also, especially, to an inaugural thesis by Dr. Victorino Pereira. This distinguished young physician divided the hæmaturic discoveries into four epochs, which he severally termed (1) the unknown, (2) the Egyptian, (3) the Brazilian, and (4) the Indian period. To these, however, as Dr. Silva Lima and myself have pointed out, must now be added (5) the Australian, and (6) the Chinese epochs of discovery (Ref. No. 13).

The part which I took in connexion with the Australian 'finds' requires explanation. In 1876 Dr. Bancroft announced his discovery of microscopic Hæmatozoa. He sent some of the human blood in capillary tubes to Dr. Roberts, of Manchester, who forwarded part of them to myself, and we verified the facts. In the contents of one of the tubes I happened to notice a single, empty, and uninjured egg-covering; and as this corresponded in size and shape with some of those I had obtained from my Natal patient (1870), I drew Dr. Bancroft's attention to the circumstance (Ref. No. 14). This induced Bancroft to search for the parent entozoon in the human body. His search proved successful, as he obtained the adult *Filaria* from a lymphatic abscess of the arm on the 21st of December, 1876. On the 20th of the following April, 1877, he communicated to me the particulars of his investigation, and I announced his discovery in the following July (Ref. No. 15). This announcement appears to have stimulated Lewis to still further efforts, who, it appears, for "the last five years had availed himself of every opportunity that presented itself" for a search after the parent worm. At length Lewis was rewarded, and on the 7th of August, 1877, he found two

mature *Filaria* in a blood-clot from a young Bengalee (then under Dr. Gayer's care for scrotal disease). Without loss of time Lewis followed up his 'find' by a series of very careful microscopic observations, and at once forwarded an elaborate account of his work to England (Ref. No. 16). Meanwhile Dr. Bancroft had forwarded some specimens of his adult entozoa to myself, together with some rather imperfect illustrations which he had executed and caused to be engraved. Some weeks elapsed before I found time to examine the worms. When at length I did so, and drew up a brief account of the structure and characters of the parasite, I forwarded it to the 'Lancet' office, where, by a singular coincidence, it arrived (as I understand) a few days after the date of the receipt of Lewis's communication. Thus our accounts of the same parasite, under different names, were published almost simultaneously (Ref. No. 17). If our illustrations be compared it will readily be seen that they refer to one and the same entozoon.

I may observe that Dr. Beale (having reproduced my figures and description in the fourth edition of one of his works) had thought it necessary to suggest an amount of ignorance on my part which, had I really displayed it, must certainly have been very reprehensible. Dr. Beale, mixing up two totally distinct parasites (*Filaria sanguinolenta* and *F. sanguinis hominis*) together, has sought to make it appear that I was unaware of the previous discovery by Lewis of the latter worm in the person of the former (Ref. No. 18). Dr. Le Roy de Méricourt has also very courteously reproduced my figures in connexion with the editorial remarks appended by him to the French version of Dr. Silva Lima's memoir (Ref. No. 19).

Here I am naturally led on to observe that notwithstanding the fairly exhaustive character of Silva Lima's memoir, very little account has been taken, either by Lima himself or by other writers, of Manson's earlier investigations. This need not excite astonishment, since few people can have had access to the journal in which Manson's original papers appeared. The 'Customs' Gazette' is little known; and but for the republication of Manson's writings in one of our professional periodicals they might long have remained unnoticed on the Continent (Ref. No. 20). Even now I cannot give the precise date of Manson's earliest paper; but in his Report published in the spring of 1877 (that is, in No. 13 of the 'Customs' Gazette') he refers to earlier papers

by himself in Nos. 10 and 12 of the same periodical. No doubt it was a feeling of isolation that at length induced Dr. Manson to make me the instrument of bringing his later researches before the public; and I think it only fair to Manson that I should quote an extract from his letter to me (dated Amoy, November 27, 1877). He says, "I live in an out-of-the-world place, away from libraries, and out of the run of what is going on, so that I do not know very well the value of my work, or if it has been done before, or better." Those parts of Dr. Manson's voluminous manuscript which give clinical details were forwarded to the English periodical that first made the profession acquainted with his writings (Ref. No. 21), whilst that part of the MS. which deals with the more distinctly helminthic aspects of the question are now submitted to the Society's hands. Other sections of the MS. remain in my hands. These deal with statistics and pathology.

Amongst the other communications to which it is necessary that I should refer, is one by Dr. Pedro S. de Magalhães. Dr. Magalhães describes free Nematodes from the waters of Rio (Água da Carioca); but notwithstanding their similarity to the larvæ of our *Filaria*, I cannot regard them as having any genetic relation with *F. bancrofti* (Ref. No. 22). I may add that Drs. Chassaniol and Guyot mention the case of a chyluria patient, thirty years a resident at Tahiti, in whom they observed "the parasite, which in all respects resembled that described by MM. Wucherer and Crevaux" (Ref. No. 23).

From what has now been stated it must be obvious to any unprejudiced person that (as in the parallel case of *Trichina spiralis*) if it be asked who discovered *Filaria bancrofti*, the answer must be framed according as to whether the inquirer refers to the adult worm, to the embryonal forms, or to the intermediate larva. To quarrel over the mere name of the parasite would be childish, and serve only to bring upon helminthologists a repetition of the criticism which Helmholtz has recently bestowed upon the conduct of naturalists generally. I have partly stated the reasons why I think Bancroft's name is most fittingly associated with this parasite, and why it should supersede the nomenclature proposed by Lewis (*Filaria sanguinis hominis*). Apart from its trinomial character, in itself an objection, the adoption of Lewis's nomenclature practically ignores the earlier discoveries of Wucherer and Salisbury; yet, from the pathological standpoint,

the name of Lewis will henceforth tower above all others in this connexion, and Bancroft would, I am sure, be the last to dispute the well-earned prerogative of Lewis. If my record is approximately correct, the dates of discovery will stand pretty much as follows:—

1. WUCHERER, 1866.—Probably embryos of *Strongylidæ* (Leuckart); Vers du Brésil (Wucherer; Davaine); *Filaria wuchereri*, suggested, conditionally, in this memoir (Cobbold).
2. SALISBURY, 1868.—*Trichina cystica* (Salisbury); nematode eggs and embryos (Cobbold).
3. LEWIS, 1870.—Worms that seem to belong to the *Filaridæ* (Busk).
4. COBBOLD, 1870.—Embryos of a minute nematode supposed to infest the urinary passages.
5. CREVAUX and SILVA LIMA, 1871 (?).—Vers de la Guadeloupe (Crevaux; Davaine).
6. CORRE, 1872.—L'helminthe dans les urines hématochyseuses (Corre).
7. LEWIS, 1872.—*Filaria sanguinis hominis*; hematozoon (Lewis).
8. FONCERVINES, 1873 (?).—Les embryons d'un ver nematoïde (Robin).
9. SONSINO, 1874.—Un nematode microscopico a guisa di Anguillula (Sonsino).
10. O'NEILL, 1875.—*Filariose dermatemica*, from craw-craw (O'Neill; Silva-Lima).
11. MANSON, 1875 (?).—*Filaria* worm in connexion with chyluria, &c. (Manson).
12. BANCROFT, 1876 (spring of). *Filarie* from human blood (Bancroft; Roberts; Cobbold).
13. BANCROFT, 1876 (winter of).—*Filaria bancrofti* (Cobbold).
14. LEWIS, 1877.—*Filaria sanguinis hominis*; mature (Lewis).
15. DA SILVA LIMA, 1877.—Filaire de Wucherer (Silva Lima; Dr. Le Roy de Méricourt).
16. MANSON, 1877.—*Filaria sanguinis hominis* (Manson).
17. MANSON, 1878.—*Filarie* in the stomach of Mosquitos (Manson); the higher larval states of the *Filarie* of Wücherer, Lewis, and Bancroft (Cobbold).

The above is the nearest approximation to a correct chronological record that I can offer. With one or two exceptions the dates refer to the actual periods of discovery. In the exceptional

instances they refer to the time of publication. I can hardly suppose, notwithstanding the pains I have taken, that it is altogether free from error. Be that as it may, the leading features of the record must, I think, be allowed to pass unchallenged; and if so, the following six propositions will likewise be accepted as correct:—

1. *Filaria bancrofti* is the sexually mature state of certain microscopic worms hitherto obtained either directly or indirectly from human blood.

2. The minute hæmatozoa in question, hitherto described as Wucherer's *Filaria*, *Filaria sanguinis hominis*, *Trichina cystica*, *Filariose dermatemica*, and so forth, are frequently associated with the presence of certain more or less well-marked diseases of warm climates.

3. The diseases referred to include chyluria, intertropical endemic hæmaturia, varix, elephantiasis, lymph-scrotum, and lymphoid affections generally, a growth called *helminthoma elastica*, a cutaneous disorder called *craw-craw*, and also, not improbably, leprosy itself.

4. It is extremely probable that a large proportion or, at least, that certain varieties of these affections are due to morbid changes exclusively resulting from the presence of *Filaria bancrofti* or its progeny within the human body.

5. It is certain that the microscopic hæmatozoa may be readily transferred to the stomach of blood-sucking insects, and it has been further demonstrated that the digestive organs of the mosquito form a suitable territory for the further growth and metamorphosis of the larval *Filaria*.

6. The character of the changes undergone by the microscopic *Filaria*, and the ultimate form assumed by the larvæ whilst still within the body of the intermediate host (*Culex mosquito*), are amply sufficient to establish the genetic relationship as between the embryonal *Filaria sanguinis hominis*, the stomachal *Filaria* of the mosquito, and the sexually mature *Filaria bancrofti*.

Finally, it remains for me to glance at the practical consequences that may be expected to flow from the acceptance of these conclusions.

One of the greatest hindrances to the due recognition of the remarkable part played by parasites in the production of human endemics and animal epizootics arises from the circumstance that no inconsiderable number of minute worms may infest a host

without obvious injury to the bearer. This immunity, in reality, proves nothing. If, for example, we take the parallel case of *Trichina* we find that several millions of entozoa may exist in the human or, at all events, in the animal bearer without the production of any palpable symptom of discomfort. In such cases it is not possible to determine the strict limits of health and disease; nevertheless, were we to double the amount of infection, an imaginary line of demarcation is at once bridged over, and the parasites become acknowledged as directly responsible for grave symptoms which may even prove fatal to the bearer. Again, the relative strength and size of the infested host constitute factors that will materially modify or limit the power of the parasite for injury. Where the entozoa are of minute size, and where their injurious action is primarily due to the mechanical obstructions they set up, it is clear that the virulence of the helminthiases, or resulting diseased conditions, will mainly depend upon the number of intruders.

Another consideration of the highest value in relation to epidemiology generally, and more especially in regard to the practical question as to the best methods of stamping out parasitic plagues, is that which refers to the life-history of the entozoon itself. It must be obvious that in all cases where the intermediate host can be captured and destroyed, the life-cycle of the parasite can be broken or interrupted; and if thus broken there is an end to the further propagation of the species. The knowledge that we have acquired by experimental research in this connexion has already enabled us to set a limit upon the prevalence of certain well-known disorders, such as trichinosis, cestode tuberculosis, and so forth. In the case of epizootics, however, which are not merely dependent upon minute entozoa, but which are also, in the way that we have seen, indirectly due to the action of intermediary hosts that cannot be readily captured or destroyed, our power of arresting the disease is comparatively limited. In the case of *Filaria bancrofti* it is probably not necessary either that a dead or living mosquito should be swallowed to ensure infection; but it is necessary that the parasitic larvæ should have dwelt within the mosquito in order to arrive at the highest stage of larval growth prior to their re-entrance within the human territory. Undoubtedly the larvæ of *Filaria bancrofti* are swallowed with potable waters. The perfect filtration of these waters before use would certainly check and, in course of time, would pro-

bably cause the total extinction of several of the many virulent diseases that now afflict the inhabitants of warm climates.

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10. SONSINO, P. Ricerche intorno alla *Bilharzia hæmatobia* in relazione colla Ematuria endemica dell' Egitto, e nota intorno ad un Nematodeo trovato nel sangue umano (Estr. dal Rend. della R. Accad. delle Scienze fisiche-matematiche di Napoli, Fascic. 6°, giugno, 1874). See also brief Review in the 'Veterinarian' for April 1874. *Idem*: Sugli Ematozoi come contributo alla fauna entozoica Egiziana, comunicazione all' istituto Egiziano, Cairo, 1877 (p. 11). *Idem*: Della *Bilharzia hæmatobia* e delle alterazioni anatomo-patologiche, &c., &c., Firenze, 1876, p. 40; also as *La Bilh. hæm. et son rôle pathologique en Égypte*, in the 'Archives Générales de Médecine' for June, 1876 (p. 672).

11. ARAUJO, S. Archives de Méd. Navale, tom. xxiv. p. 229. Also quoted by Silva-Lima (*l. c.* p. 442). See also ref. to O'Neill's paper (in Appendix below).

12. COUTO, A. Gazeta Medica da Bahia, 1877 (Jan. & Feb.), quoted by Silva Lima (*l. c.* p. 444).

13. PEREIRA, T. V. Inaugural Thesis, quoted by Silva Lima, in Gaz. Med. da Bahia, Sept. 1877, also in the Arch. (*l. c.* p. 449).

14. COBBOLD, T. S. On the Verification of recent Hæmatozoal Discoveries in Australia and Egypt.—British Medical Journal for June 24, 1876; repr. in the 'Veterinarian,' July 1876.

15. COBBOLD, T. S. Discovery of the Adult Representative of Microscopic *Filaria*, in a letter to the Editor of 'The Lancet,' July 14, 1877 (p. 70).

16. LEWIS, T. R. *Filaria sanguinis hominis* (mature form) found in a Blood-clot in Nævoid Elephantiasis of the Scrotum.—The Lancet, Sept. 29, 1877, p. 453 (with figs.).

17. COBBOLD, T. S. On *Filaria bancrofti*.—The Lancet, Oct. 6, 1877, p. 495 (with figs.).

18. BEALE, L.—The Microscope in Medicine, 4th edit. London, 1878 (p. 505). See also D. H. Gabb, below.

19. MÉRICOURT, A. LE ROY DE.—Archives de Médecine Navale, Dec. 1877 (p. 448).

20. MANSON, P. Report on Hæmatozoa, in the 6th part of the Customs' Gazette, No. xxxiii. Jan.-March: Shangae, 1877.

21. MANSON, P.—Chinese Hæmatozoa (thirty-five cases).—Medical Times & Gazette, March 2 and 10, 1878 (pp. 220 and 249); also additional particulars of a Case, Med. T. & G. for March 23, 1878 (p. 304).

22. MAGALHÃES, P. S. de.—O progresso Medico de Rio de Janeiro,

Nov. 15, 1877; letter in *Gazeta Medica da Bahia*, December 1877. See also Bourel-Roncière's *Analyse, &c.* in *Archives de Médecine Navale* for March 1878, p. 208 (quoted below).

23. CHASSANIOL, A. et F. GUYOT.—Hématurie grasseuse ou chyleuse; in their "Quelques Notes de Géographie Médicale recueillies a Taïti," *Archives de Méd. Navale*, Jan. 1878 (p. 65).

APPENDIX (August 1st, 1878).

Since this communication was read, several additional memoirs and papers have come to my knowledge, as undermentioned.

24. O'NEILL, J. On the presence of *Filaria* in Craw-Craw.—*The Lancet*, Feb. 20, 1875 (with figs. p. 265). See also *Archives de Méd. Navale*, vol. xxiv. p. 229 (from *Revista Med. da Rio de Janeiro*), and *Arch.* for March 1878 (p. 204).

25. COLES, G. C. On Lymph Scrotum.—*Path. Soc. Rep.* in *British Med. Journ.* for March 9, 1878; also in 'The Lancet' (same date).

26. BOUREL-RONCIÈRE. *Pathologie Exotique*. This is an analysis and commentary, chiefly of Dr. Silva Lima's second memoir (*Gaz. Med. da Bahia*, Nov. 1877), including a case by Dr. Silva Araujo. Many references are given. *Archives de Méd. Navale*, March 1878, pp. 200-215.

27. DA SILVA LIMA. The late Dr. Wucherer and the *Filaria bancrofti*. Letter in reference to an article entitled 'Helminthological work in 1877.'—*The Lancet* for March 23, 1878, p. 441 (dated Bahia, Feb. 26).

28. COSSÉ. Sur l'Helminthe rencontré par Wucherer et Crevaux, &c.—*Revue Montpellier*, i. p. 190.

29. MANSON and COBBOLD. On *Filaria sanguinis hominis* in reference to Elephantiasis, Chyluria, and allied Diseases.—*Rep.* of the London Medical Society's Proceedings for March 25, 1878, in 'The Lancet' for March 25, 1878 (p. 465).

30. COBBOLD. Mosquitoes and Human *Filaria*.—*Clinical Memorandum*, in 'British Medical Journal' for March 16, 1878 (p. 366). See 'Popular Science Review' for April 1878.

31. GABB, D. H. Letter announcing the occurrence of *Filaria sanguinis hominis* at Hastings.—*The Lancet* for June 22, 1878.

32. SONSINO, P. Sull' *Anchylostoma duodenale* (giving a differential diagnosis as between its embryos and those of *Filaria*). *Benha*, May 16, 1878. *Estr. dall. Imparziale*.

33. LEWIS, T. R. Remarks regarding the Hæmatozoa found in the Stomach of *Culex mosquito*.—*Proceedings of the Asiatic Society of Bengal* for March 1878, p. 89.

34. COBBOLD, T. S. Letter concerning *Filaria sanguinis hominis*, in 'The Lancet' for July 13, 1878, p. 64. See also 'Midland Naturalist' for August 1878.